The investigations of BOWMAN were in the Dry Tortugas, and include many details regarding the morphology and structure of the various organs of the tree, including development and growth rate of the viviparous embryos. Measurements of the latter show a 4.7 cm. elongation of the emerging hypocotyls in 34 days. The results of transpiration studies show a lower rate of water loss with higher concentrations of sea water. The red mangrove is facultative in its growth in fresh and salt water, but requires the latter for optimum development. At least 2000 sq. miles of the tidal flats of the Philippine Islands are occupied by mangrove forests. The floristic, ecological, and economic characteristics of these forests of the sea have been described by BROWN and FISCHER.[14] Keys are provided for the recognition of the 30 principal species belonging to 16 different families. In addition to the well known aerial roots and viviparous habit of the mangroves, some of the notable features of these woodlands are the scanty undergrowth, the fairly numerous epiphytes, the myrmecophilous plants, and the frequent fringing of Nipa palms.

While the original stands of this forest contain trees of fair size yielding hard cabinet woods of excellent quality, the greater portion of the area is important only for the production of a good quality of firewood and for tan bark. The Nipa palm is important for alcohol production, and seems to present a possibility of utilization for sugar. Some cultivation of both the mangroves and the Nipa palms has proved successful; the former has also been used with good results in planting dykes and embankments to prevent the erosive action of the sea.—GEO. D. FULLER.

**Age and area hypothesis.**—The development of this hypothesis by WILLIS has been noted in this journal,[15] and now an analysis of the flora of New Zealand seems to strengthen his contentions.[16] The evidence in favor of the majority of endemics being of recent origin rather than relics is rather convincing.

Recently a floristic study of the plants of Stewart Island[17] yielded results supporting the hypothesis of the families and genera being represented in proportion to the number of genera and species respectively contained in them in New Zealand. The oldest forms are best represented in the flora, and the endemics are in the largest (in general, oldest) families and genera of New Zealand.

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[14] BROWN, WM. H., and FISCHER, A. F., Philippine mangrove swamps. P.I. Dept. Agric. and Nat. Res., Bur. For. Bull. **17**:132. *pls. 47*. 1918.

[15] BOT. GAZ. **61**:82. 1916; **62**:160. 1916; **63**:419. 1917; **64**:263. 1917; **65**: 116–117, 486. 1918.

[16] WILLIS, J. C., The sources and distribution of the New Zealand flora, with a reply to criticism. Ann. Botany **32**:339–367. 1918.

[17] ———, The flora of Stewart Island (New Zealand): a study in taxonomic distribution. Ann. Botany **33**:23–46. 1919.

The other islands about New Zealand also supply similar data.[18] In studying these floras WILLIS contends that through this hypothesis one is able to prophesy that the plants which reach outlying islands will be on the whole the oldest, and therefore the most widespread upon the mainland, and finds, on examining the facts, that the prophecy is completely fulfilled. The facts presented seem to support the contention and lead the author to restate the hypothesis thus: "The area occupied at any given time, in any given country, by any group of allied species at least ten in number, depends chiefly, so long as the conditions remain reasonably constant, upon the age of the species of that group in that country, but may be enormously modified by the presence of barriers such as seas, rivers, mountains, change of climate from one region to the next or other ecological boundaries, and the like, also by the action of man, and by other causes. In other words, age and area is the chief positive, the action of barriers the chief negative, factor in plant distribution, while in recent times the action of man has become of greater importance than either."—GEO. D. FULLER.

**Gases and germination.**—KIDD[19] has studied the effect of various partial pressures of carbon dioxide and oxygen upon the sprouting of potatoes, and concludes that "(1) Oxygen is harmful to the potato tuber in concentration of about 5–10 per cent; oxygen 80 per cent kills in 4–5 weeks; oxygen 5–10 per cent is the optimal concentration for sprouting. (2) The harmful action of oxygen is increased in the presence of carbon dioxide. (3) Carbon dioxide inhibits sprouting in a concentration of 20 per cent. This concentration is at the same time to some extent harmful. (4) Higher concentrations of carbon dioxide cause marked injury and death." NOBOKIRCH has found that actively growing plant organs grow faster in oxygen pressures considerably below that of the normal atmosphere, but that such reduced pressures finally prove injurious, due to accumulation of metabolic products; while at normal oxygen pressures no such injury occurs. This may throw in question KIDD's interpretation that pressures above 10 per cent are injurious, especially for pressures up to the normal atmosphere. In general, due to their coats and other coverings, seeds are reduced in rate and percentage of germination by any reduction of oxygen pressure below the normal atmosphere, and often favored by greater oxygen pressures. Some of the work of APPLEMAN has indicated that oxygen supply is a limiting factor to germination of the potato, quite in contrast with KIDD's results. It is interesting that carbon dioxide showed no forcing action due to its anaesthetic properties. It is possible that it did cause increases in respiration, while not increasing or

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[18] WILLIS, J. C., The floras of the outlying islands of New Zealand and their distribution. Ann. Botany **33**:267–293. 1919.

[19] KIDD, FRANKLIN, Laboratory experiments on the sprouting of potatoes in various gas mixtures. New Phytol. **18**:248–252. 1919.